

MULTI-BOMBE CONNECTING DEVICE FOR LIQUEFIED PETROLEUM INJECTION VEHICLE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Korean Application No. 10-2003-0065541, filed on September 22, 2003, the disclosure of which is incorporated fully herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a Liquefied Petroleum Injection (LPI) vehicle mounted with a plurality of bombes. More particularly, the present invention relates to a device connecting the plurality of bombes to enable the fuel to flow between the plurality of bombes.

BACKGROUND OF THE INVENTION

[0003] In Liquefied Petroleum Gas (LPG) vehicles, the LPG provided from a bombe is typically injected in a gaseous state to the engine through a vaporizer and a mixer. However, LPG vehicles having the system described above have many drawbacks relating to engine output, fuel consumption, starting at low temperatures, engine exhaust gas, and the like. Thus, vehicles using LPI systems have recently been developed.

[0004] In LPI vehicles, the liquefied petroleum (LP) is injected by using a fuel pump built into the bombe, and the injector injects the fuel in a liquid state into the

engine. This results in excellent engine output, fuel consumption, starting at low temperatures, engine exhaust gas, and the like. LPI vehicles generally require a plurality of bombes, and the fuel pump is attached only to one of the plurality of bombes. The remaining bombes provide fuel via the bombe attached to the fuel pump. The drawback of this configuration is that when the LPI vehicle mounted with a plurality of bombes ascends or descends a slope without sufficient fuel, the fuel flows downward and becomes concentrated in only one bombe, which usually is not the bombe attached to the fuel pump. This causes a shortage of fuel in the fuel pump-attached bombe, which, in turn, causes a shortage of fuel to the engine.

SUMMARY OF THE INVENTION

[0005] The present invention provides a multi-bombe connecting device for an LPI vehicle adapted to collect fuel in a fuel pump-attached bombe when the LPI vehicle mounted with a plurality of bombes ascends or descends on a slope, thereby preventing a fuel cut off phenomenon of the engine. The multi-bombe connecting device for an LPI vehicle comprises a main bombe having a fuel pump therein and one or more auxiliary bombes. A fuel pipe connects the main bombe and the auxiliary bombe that allows the fuel to flow between the main bombe and the auxiliary bombe. A fuel isolating device closes the fuel pipe when a vehicle ascends or descends on a slope and the auxiliary bombe is positioned lower than the main bombe. The present invention further comprises an auxiliary fuel pipe connecting the main bombe and the auxiliary bombe and disposed higher than the fuel pipe.

[0006] The fuel isolating device is composed of a housing including a passage slanted at a certain degree and containing a ball. A panel is slidably installed in the

passage and is attached in the rear to a rod. A spring is attached to the panel to return the panel to its original position when the panel is not contacting the ball.. A switch that contacts the rod controls activation of the fuel isolating device (“on” state) when the ball applies pressure to the panel as the vehicle ascends or descends on a slope. A throttle valve opens and closes the fuel pipe. A throttle valve actuator closes the fuel pipe by activating the throttle valve when the switch is turned on.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a better understanding of the nature and objects of the present invention, reference should be made to the following detailed description with the accompanying drawings, in which:

[0008] FIG. 1 shows the structure of a multi-bombe connecting device for an LPI vehicle according to an embodiment of the present invention; and

[0009] FIG. 2 is a detailed view of a fuel isolating device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The preferred embodiment of the present invention will now be described in detail with reference to the accompanying drawings.

[0011] To achieve a minimal vehicle height as well as a low floor panel 1 of an LPI vehicle, the required fuel capacity cannot be satisfied by using only one bombe. Thus, an LPI vehicle, according to an embodiment of the present invention as shown in FIG.

1, comprises main bombe 20 having a fuel pump 10 and two auxiliary bombes 30 and 32.

[0012] Main bombe 20 and auxiliary bombes 30 and 32 are respectively connected via fuel pipes 40 and 50, allowing fuel to flow between the three bombes. Fuel pipes 40 and 50 include fuel isolating devices 60 and 70, respectively. When one of the two auxiliary bombes 30 and 32 is positioned lower than main bombe 20 as a vehicle ascends or descends on a slope, the fuel pipe connecting the relevant auxiliary bombe and the main bombe 20 is closed by the isolating device.

[0013] When auxiliary fuel pipes 80 and 90 connect main bombe 20 and auxiliary bombes 30 and 32 at a higher position than fuel pipes 40 and 50, and a sufficient amount of fuel is in the bombes, fuel flow is improved between each bombe 20, 30, and 32. Further, when the vehicle's fuel is not low, auxiliary fuel pipes 80 and 90 facilitate movement of fuel between the bombes.

[0014] Referring to FIG. 2, fuel isolating devices 60 and 70 mounted at fuel pipes 40 and 50 are identical in shape but are placed in opposing directions to each other (i.e., the two fuel isolating devices 60 and 70 are mounted so that the ends with the balls face each other and the ends with the panels face away from each other). As shown in FIG. 2, housing 62 includes passage 61 and is fixed to fuel pipe 40 via bracket 63. Passage 61 is formed at a certain incline ($A = 11.3^\circ$). Ball 64 is placed at a lower side in passage 61, while panel 65 formed at the rear side with a rod is slidably disposed at an upper side in passage 61. Spring 66 positioned in passage 61 and attached to panel 65 to return panel 65 toward the ball 64.

[0015] The upper side of passage 61 includes a switch 67 that activates throttle valve actuator 68. If a vehicle ascends or descends on a slope, causing ball 64 to roll toward and apply pressure to panel 65, the rod of panel 65 contacts switch 67, and throttle valve actuator 68 is turned. Once switch 67 is turned on, throttle valve actuator 68 activates throttle valve 69 mounted on fuel pipe 40 and closes fuel pipe 40.

[0016] Referring to FIG. 1, when an LPI vehicle having insufficient fuel (approximately 10% or less of the bombe capacity) moves on an ascending slope (e.g. 11.3° or more), the fuel of main bombe 20 and auxiliary bombe 32 flows into auxiliary bombe 30. Fuel isolating device 60 mounted on fuel pipe 40 stops the fuel, which flows to auxiliary bombe 30 when the vehicle moves on an ascending slope, thereby preventing fuel shortage in main bombe 20. Provided that the LPI vehicle ascends on a slope, ball 64 of the fuel isolating device 60 presses the panel 65, and switch 67 turns on by being contacted with the rod of panel 65. Throttle valve actuator 68 activates throttle valve 69 mounted on fuel pipe 40 and closes fuel pipe 40, thereby stopping the fuel flow through fuel pipe 40.

[0017] When the LPI vehicle moves on a flat surface, ball 64 of fuel isolating device 60 shifts to its initial position, and the rod of panel 65 is separated from the switch 67, and thus the switch 67 is turned off. Throttle valve actuator 68 activates throttle valve 69 and opens fuel pipe 40. Thus, the fuel can flow through fuel pipe 40.

[0018] On the other hand, if the LPI vehicle, having insufficient fuel (approximately 10% or less of the bombe capacity), moves on a descending slope (e.g. 11.3° or more), the fuel of main bombe 20 and auxiliary bombe 30 flows to auxiliary bombe 32. Once

fuel isolating device 70 mounted on fuel pipe 50 stops fuel flow toward auxiliary bombe 32, fuel shortage resulting from a lack of fuel in main bombe 20 can be prevented.

[0019] In the above described embodiment of the present invention, two auxiliary bombes are used. However, the number is not limited as long as the bombe connecting device of the present invention is applied in an LPI vehicle using at least one auxiliary bombe.

[0020] As apparent from the foregoing, there is an advantage in the present invention, in that the fuel isolating devices prevents fuel shortage in a main bombe of an LPI vehicle when the vehicle ascends or descends a slope.